



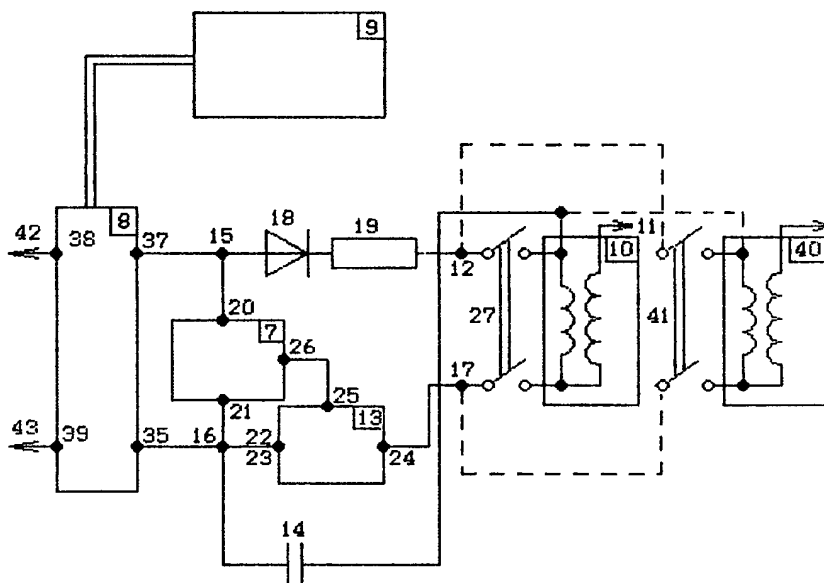
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>H05C 1/04, A01M 23/38, B65D 19/00</b>		<b>A1</b>	(11) International Publication Number: <b>WO 97/01262</b>
			(43) International Publication Date: 9 January 1997 (09.01.97)
(21) International Application Number: PCT/RU95/00265		(81) Designated States: AM, AT, AU, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KG, KP, KR, KZ, LK, LT, LU, LV, MD, MG, MN, MX, NO, PL, PT, RO, RU, SE, TJ, UA, US, UZ, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) International Filing Date: 7 December 1995 (07.12.95)			
(30) Priority Data: 95110706 23 June 1995 (23.06.95) RU			
(71)(72) Applicant and Inventor: ROSCHUPKIN, Evgeny Yakovlevich [RU/RU]; 4-ya ul. Mariinoi Roschi, 17-121, Moscow, 129594 (RU).		Published With international search report.	
(72) Inventors; and (75) Inventors/Applicants (for US only): BAGAEV, Vladimir Ivanovich [RU/RU]; ul. Kustanaiskaya, 5-1-94, Moscow, 115682 (RU). SOKOLENKO, Konstantin Konstantinovich [RU/RU]; ul. Kulakova, 2-1-518, Moscow, 123181 (RU). SCHERBAN, Grigory Andreevich [RU/RU]; ul. Yablochkova, 35B-214, Moscow, 127322 (RU). KRUP-SKY, Sergei Alexandrovich [RU/RU]; pos. Severny, 48-13, Balashikhinsky r-n, Moskovskaya obl., 143954 (RU). TIKHONOV, Viktor Pavlovich [RU/RU]; pr-t 60-letia Oktyabrya, 27-2-31, Moscow, 117036 (RU).			

(54) Title: A DEVICE FOR RIDDING OF RODENTS: AN ELECTRICAL DERATIZATOR

## (57) Abstract

The device for eliminating rodents in the form of an electrical anti-rat device comprises a body made from a dielectric material and made as a packaging means with a load platform (1) and supports (2), provided with high-voltage electrodes (3 and 4) secured on the packaging means in the place where the rodent will inevitably touch them and connected to a power supply system, wherein a source of high-voltage pulses (6) is made as a high-voltage transformer (10) and a pulse generator (10), comprising a power capacitor (14), a controlled electronic key (13), a diode (18), a charging resistor (19), and power supply terminals. The electrodes (3 and 4) are coupled to the free terminal (11) of the transformer secondary, the beginning of the transformer secondary and the point of connection of the end of the transformer primary and the beginning of the transformer secondary are coupled through a two-way contactor (27) to the output terminals (12 and 17) of the pulse generator, the input terminals (15 and 16) thereof are coupled to the primary power supply source. The power supply system is provided with a control unit (7). The packaging means is made as a returnable or expendable pallet, the load platform (1) rests on the floor through non-metallic supports (2), and the contact electrodes (3 and 4) are made linear, arranged in grooves provided in the load platform and along the periphery of the packaging means, and galvanically interconnected. The device has a quick-disconnect electrical contact (5) for coupling to the power supply system. The device is provided with a non-contact detector (9) adapted to detect rodents and with a safety system (8) for servicing personnel. The device is provided with a contactor for automatic setting thereof which is activated as soon as the lighting in the premises is switched off. For increasing the scope of protection, the device is provided with a second high-voltage transformer (40).



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

A DEVICE FOR RIDDING OF RODENTS:  
AN ELECTRICAL DERATIZATOR

Technical Field

5       The present invention relates to devices for ridding of rodents, predominantly of rats and mice, and is intended for protecting foodstuffs and agricultural products against rodents by deratization of storage premises and warehouses.

Background Art

10       Man has been painstakingly combating rodents, first of all, rats, which cause large losses of products in the storage premises, by resorting to most diverse methods and means: toxic chemicals, different kinds of catchers and traps, and even adhesive substances; nevertheless, the efficiency of such  
15 activities is obviously inadequate.

      It is practically reasonable to use mechanical catchers and traps only within limited spaces of dwelling premises, where the paths followed by rodents are known precisely, and where regular inspections and recharging of these devices are  
20 ensured.

      The most common practice of using poisoned baits not only involves appreciable expenses in large-scale applications of this method and in developing novel toxic chemicals, but also poses threats. Firstly, rodents, especially rats, develop  
25 resistance to the toxic chemicals employed, this resistance being then inherited by their numerous progeny. Secondly, the perished infected rodents, which have not been found in secluded places, represent dangerous sources of different epidemic diseases. Thirdly, the poisoned bait may be eaten by  
30 domestic animals, and then poison may enter human organism via the food chain.

      The method of scaring rodents away from the objects to be protected appears more promising.

35       Known in the art are devices which ensure this scaring effect by setting up an ultrasonic "shield" with the help of a generator producing acoustic signals having a definite amplitude and frequency (see, e.g., WO 85/02319, A01M 29/02, 1984; SU N1754039, A01M 19/00, 1990).

Rodents cannot withstand the ultrasonic action and leave the objects thus protected. Hence, the problem of removing and destroying the captured or perished animals stands no longer.

The devices of the type described are not free from the following disadvantages: complexities in manufacturing and operating the equipment; limitations on the shape and dimensions of the zone of action; high consumption of electric power; possible negative effect on the human organism.

Known in the art is a device, namely, an electrical deratizator, adapted to shock rodents with electric current. This device, which we have adopted as a prototype because it shares the greatest number of essential features common with the device of the present invention and relates to the same technical field, comprises a body with high-voltage contact electrodes secured thereon and arranged at the sides of an entrance opening, i.e., in the place where the rodent will inevitably touch these electrodes. Voltage is fed to the electrodes through a power supply system from a high-voltage source. On contacting two said electrodes simultaneously, the animal is shocked with electric current (US, 4,780,985; A01M 19/00, 1988).

The prototype, comprising a trap with electrifiable members at the entrance thereto, suffers from the following disadvantages: the electric-shock effect on rodents is ensured only at the trap entrance and only on the two-pole circuit principle: the animal has to touch two electrodes simultaneously; the perished animal remains between the electrodes at the trap entrance, short-circuiting the output terminals of the high-voltage generator, this leading to a useless increase in the consumption of power (it is not safe for the generator and may involve fire hazards). Furthermore, access to the killing zone for the next rodent proves to be blocked till the trap is cleared.

The electric circuit of such a device is a source of enhanced hazard to the personnel both in the process of mounting and in service.

The advantage that the animal will be killed in a humane manner during 1 to 2 seconds and that its corpse will be found in a definite place, may be reduced to a minimum, if said corpse is detected after a period of several hours, when

vectors of infectious diseases, parasitising on the rodent have already spread.

#### Disclosure of the Invention

The main object of the present invention is to broaden the  
5 range of technical means for ridding of rodents, predominantly of rats, which exert an electric action that scares the animals away from the object being protected, by the provision of a fundamentally novel type of deratization device possessing a set of the following properties:

10 the action on the animal is non-lethal, the produced painful effect scares rodents away, but it is safe for the attending personnel;

the boundary of the zone of action of this effect is continuous and encompasses completely the boundaries of the  
15 object being protected, with allowance for the behavioural stereotypes of rodents;

the application of the device of the present invention does not interfere with the use of the currently adopted methods, means and organisation of storage and transportation  
20 of the products being protected.

All these properties are ensured along with the simplicity and reliability of the design, combined with a low power consumption.

The required technical result is accomplished by that in  
25 the device of the invention for ridding of rodents, comprising a body manufactured from a dielectric material, with high-voltage contact electrodes secured on said body in the place where the rodent will inevitably touch them, said electrodes being connected by a power supply system with a primary power  
30 supply source, said body is made as a packaging means with a load platform; said power supply system is provided with a control unit made as a three-electrode time-setting device and with a source of high-voltage pulses made as a high-voltage transformer and a pulse generator comprising a power capacitor,  
35 a controlled key, a diode, a charging resistor, and power supply terminals, said high-voltage contact electrodes being coupled to the free terminal of the transformer secondary, the beginning of the transformer primary and the point of connection of the end of the transformer primary and of the  
40 beginning of the transformer secondary being coupled through a

two-way contactor to the output terminals of said pulse generator, the input terminals being coupled to the primary power supply source, said diode and said charging resistor being inserted in the conducting direction into one bus of the pulse generator in series from the input terminal to the output terminal thereof, said controlled key being inserted into another bus of the pulse generator, the power transformer being coupled with its output terminals between the input terminal and the beginning of the transformer primary, the anode and the cathode of the time-setting device being coupled to the input terminals of the pulse generator, the control output of said time-setting device being connected to the controlled output of said key. In the device of the invention the packaging means is made as a returnable or expendable pallet, its load platform rests on the floor through supports made of a dielectric material, the contact electrodes are made linear, arranged in grooves provided in the load platform and along the periphery of the packaging means, and galvanically interconnected. Furthermore, the device of the invention is provided with a quick-disconnect contact made as a resilient member, whose matching parts are coupled to the high-voltage output of the transformer and to the contact electrodes and are arranged on stationary supports in the premises and on the deratizator body, respectively. The device of the invention is provided also with a non-contact detector and with a safety device comprising a d-c source made as a full-wave rectifier and a filtering capacitor, the a-c diagonal of the rectifier being coupled to the buses of the primary power supply source through a current-limiting resistor, the non-contact detector having its relay winding and "dry" contact inserted in series into the d-c diagonal of said rectifier, the make contact of the relay being arranged in the bus between the point of coupling the a-c diagonal of the d-c source and the output terminal of the safety device, the break part of the change-over contact being coupled in parallel with the current-limiting resistor, and the make part of said contact being coupled between the point of coupling the current-limiting resistor to the primary power supply source and the second output terminal of the safety device. The device of the invention is provided with a contactor which couples the input terminals of the pulse

generator to the primary power supply source through one of the lighting network switch contacts in parallel with illumination lamps, said lighting network switch having its other contact inserted in parallel with said terminals. The device of the invention is also provided with a second high-voltage transformer similar to the first high-voltage transformer, the primary windings of said first and second transformers being coupled through a second two-way contactor to the output terminals of the pulse generator in parallel aiding, the free output of the second high-voltage transformer being coupled to high-voltage contact electrodes insulated from the electrodes coupled to the first transformer.

In the development of the present invention use was made of the method of exerting pulsed electrical action on the living organism, which had been proposed by the authors and embodied earlier in a different technical field (Application No. 84-011397, GOB13/00, December 4, 1994).

The essence of this method is that the organism is subjected to the action of pulsed current, which leads to recharging of the organism capacitance on the single-wire circuit principle. High-voltage current pulses contain at least two opposite-polarity half-waves which ensure effective action even in the absence of direct contact with the "earth" or return wire. An attempt to touch the electrified object brings about a complex (audio-visual, painful, and convulsive) repulsive effect. Medical and biological investigations established that this effect is not dangerous to life; habituation to it is absent. The authors received a favourable expert decision from competent bodies about the results of tests concerning the clinical and physiological consequences of the action of pulsed current generated by the device on the organism of laboratory animals.

An analysis of typical structures of product warehouses and storage premises showed that the prior-art methods and means practically cannot ensure effective protection of the stored products against rodents, especially against rats. The known scaring means have a definite zone of action, they are not always convenient for ensuring reliable protection under particular conditions of packaging and arranging loads in storage premises.

Therefore, we decided to ensure protection of storage premises in such a manner as not to interfere with the load-handling technology adopted in the field, in which technology, with a view to raising the level of comprehensive mechanisation, both in Russia and in other countries, unitized members (pallets) are widely used, employed either separately or in specialised systems for transportation and storage of loads.

To this end, the body of the device according to the invention was made as a means for packaging provided with a platform for loads, said means possessing the property to repel rodents when they try to gain access to the load disposed thereon. The effectiveness of such protection will depend not on the dimensions of the zone of action (it is sufficient that its boundaries should exceed the overall dimensions of the object to be protected), but on the continuity of the zone of action both in space and time.

#### Brief Description of the Drawings

The essence of the present invention will become more fully apparent from a consideration of the accompanying drawings, in which: Fig. 1 is a block-diagram of the deratization device according to the invention; Fig. 2 is a block-diagram of the source of high-voltage pulses; Fig. 3 is a diagram of the safety device; and Fig. 4 is a diagrammatic presentation of the circuit for coupling the source of high-voltage pulses to the lighting system of the premises.

#### Best Method of Carrying out the Invention

The device for ridding of rodents, according to the invention comprises a body made as a packaging means (particularly, a pallet) with a load platform (an upper deck) 1 and supports 2 made from a dielectric material, on which linear high-voltage contact electrodes 3 are secured, arranged in grooves in the load platform 1 and coupled galvanically with electrodes 4 which are secured along the periphery of the platform 1. The electrodes 4 are coupled through a resilient contact 5 to a power supply system which comprises a source of high-voltage pulses 6, a control unit 7 made as a three-electrode time-setting device, a personnel safety device 8, and a non-contact detector 9 for detection of rodents.



The source of high-voltage pulses 6 is made as a high-voltage transformer 10 having a steeply drooping external characteristic, the high-voltage terminal of the secondary winding of the transformer 10 being coupled to the resilient contact 5. The primary and secondary windings of the transformer are connected in series aiding, and the beginning of the primary winding is coupled to the first output terminal 12 of a pulse generator which comprises a controlled electronic key 13, an energy-storing member 14 made as a power (non-polar) capacitor and a power supply bus, to which appropriate input terminals 15 and 16 and output terminals 12 and 17 are coupled. A diode 18 and a charging resistor 18 are inserted in series into one bus of the pulse generator from the input terminal 15 to the output terminal 12 in the conducting direction; the controlled key 13 is inserted into the other bus of the pulse generator. The outputs of the energy-storing member (non-polar capacitor) 14 are inserted between the output terminal 15 and the beginning of the secondary winding of the transformer 10.

Anode 20 and cathode 21 of the time-setting device 7 are coupled to the input terminals 15 and 16 of the generator, respectively. Cathode 23 and anode 24 of the controlled key 13 are coupled to another bus 22 of the generator between the input terminal 16 and the output terminal 17, respectively. Controlled output 25 of the key 13 and controlling output 26 of the time-setting device 7 are electrically connected.

Electrical connection of the output terminals 12 and 17 of the pulse generator with the primary winding of the transformer 10 is effected by means of a two-way contactor 27.

The safety device 8 and the non-contact rodent-detector 9 are not prerequisite components of the electric power system of the deratizator for the latter to serve its functional purpose. The non-contact detector 9 reduces power consumption in the absence of the object to be acted upon. In this case it would be sufficient to disconnect one phase of the primary power supply source. However, when the deratizator operates under elevated humidity conditions, it is necessary to disconnect both phases, this being ensured by the safety device 8. This guarantees electrical safety of the device operation due to complete disconnection of the generator from the primary source of electric power.

The safety device comprises a d-c source 28 made as a full-wave rectifier 29 and a filtering capacitor 30; the a-c diagonal of the source 28 is coupled to the buses of the primary power supply source through a current-limiting resistor 31. Inserted in series into the d-c diagonal of the source 28 are the winding of relay 32 and "dry" contact 33 of the non-contact detector 9. Make contact 34 of the relay 32 is arranged in the bus between the point of coupling the a-c diagonal of the source 28 and output terminal 35 of the safety device 8. The break part of changeover contact 36 is coupled in parallel to the current-limiting resistor 31; the make part is coupled between the point of coupling the current-limiting resistor 31 to the primary power supply source and the second output terminal 37 of the safety device 8. As the non-contact detector use can be made of a conventional device, such as an IR detector, a radiometric detector, a capacity transducer, and the like.

Input terminals 38 and 39 of the safety device 8 are coupled to the primary power supply source. One of the main components of the device for ridding of rodents according to the invention is its electrifiable part which consists of the contact electrodes 3 and 4 and constitutes an obstruction practically insurmountable for rodents in the path to the products being protected on the packaging means (on the pallet). All the known unitized types of pallets, expendable or returnable, one-deck and two-deck, used either independently or as components of the main kinds of packaging means, necessarily comprise the following members: supports 2 manufactured from a dielectric material (wood, fibreboard, plastics, and the like), about 10 cm high; crosswise members made of a dielectric material for mechanical binding of the supports; and an upper deck 1 made from a dielectric material. Most often this deck consists of wooden boards to 1.5 cm thick and to 12 cm wide, arranged with a 3 to 5 cm clearance between the boards (to reduce the weight of the structure and save the material).

Rodents, as a rule, gain access to the load from the outside of the pallet or through clearances in the upper deck. Therefore, in order to make the pallet practically inaccessible for rodents, linear electrodes 3 made from a current-conducting strap (e.g., from a steel strap, laminated film material,

current-conducting cloth, and the like) are secured in the lower plane (in longitudinal clearances) of the upper deck; a similar electrode 4, provided along the periphery of the upper deck, is connected electrically with all the longitudinal electrodes 3 and, through resilient contacts 5, with the source of high-voltage pulses.

Resilient contacts 5 are made as quick-disconnect current-conducting connectors, whose mating parts are connected with the electrode 4 and high-voltage output 11 of the transformer 10, respectively. Said contacts are made from a bent metal strip, a current-conducting or metallised rubber pad, metallic haywire, etc. The only condition the design of these contacts should meet is to ensure electric conduction and mechanical wear-resistance with less stringent requirements to the accuracy of the pallet positioning in the premises. With such an embodiment, the device for ridding of rodents, having imparted a new property to the pallet, practically will not affect the functional characteristics thereof as a means for transportation and storage of loads. If the upper deck is continuous (made of fibreboard, plastic, and the like), the linear electrodes should be secured to it from below along the supports.

For the electrical connection between the linear electrodes 4 of the pallets assembled in a group (consisting of up to six pallets) to be established automatically, at least one resilient contact 5 is attached to the electrodes 4 arranged along the periphery in the end faces of the deck. These contacts, when the pallets are transferred and brought into the appropriate place in the storage premises mechanically, provide electrical connection between the electrodes of the pallets in the group.

The mating parts of the resilient contacts 5 are mounted stationary on the walls of the warehouse or nearby on dielectric supports at the height of the upper deck of the pallets. If possible, pallets arranged stationary along the walls, provided with electrodes 3 and 4 in accordance with the disclosure of the present invention, can be used as such supports. On the last-mentioned pallets other pallets with loads can be installed with the help of a lift truck, without coupling the electrodes of the upper pallets to the electrodes

of the lower pallets, because load protection in such a case is already reliably guaranteed.

We have established experimentally the minimum amplitudes of the high-voltage pulses exerting a stable repulsive action on rodents in premises with a floor from a dielectric material (wood, linoleum, ceramic tiles, etc.). The value of this characteristic for rats under these conditions is  $10 \pm 2$  kV. If the floor is made of concrete, earth, or a dielectric, under humid conditions or with a constantly high moisture content in the premises, the amplitude can range from 5 to 6 kV. Tests on larger rodents demonstrated a stable repulsive effect with similar parameters.

The high-voltage transformer comprised in the power supply source, for reasons of electrical safety for the attending personnel and stability to external short-circuits, has a sharply drooping external characteristic and the upper limit of the amplitude of output pulses not exceeding 25 kV.

The technical load limit allows coupling to one transformer from one standard pallet having an area of about 1 sq. metre (the amplitude of pulses thereon will be about 25 kV) to six pallets (the amplitude of pulses thereon will be about 10 kV). However, the circuitry of the pulse generator, as well as its design features, make it possible to supply from it two high-voltage transformers 10 and 40 simultaneously; the primary windings of these transformers should be coupled through autonomous connectors 27 and 41 to the output terminals of the generator in parallel aiding. In this case the source of high-voltage pulses can supply from one pallet to twelve pallets, and there will be practically no potential difference between groups of pallets coupled to different high-voltage transformers. To preclude thermal overloads of the high-voltage transformers 10 and 40, their appropriate temperature conditions can be ensured by the special power supply mode of the controllable key.

Such an embodiment of the source of high-voltage pulses will make it possible to protect from rodents at least 15 sq. metres of the warehouse area simultaneously (with allowance for technological and fire-preventing clearances between groups of pallets).

Power consumption from the primary source (single-phase mains, 220 V, 50 - 60 Hz) occurs from half-waves of the same polarity; simultaneous coupling of a large number of devices of the invention (in warehouses having a large area) may overload the mains. The mains loading can be reduced almost two-fold by alternating the coupling of the input terminals of the generators to the phase wire of the primary source. Then, with an accuracy to one source of pulses, two groups of consumers are formed, and each such group will consume energy of the half-waves of its own (positive or negative) polarity; the external characteristics of the sources of high-voltage pulses will be almost the same.

Warehouses with no natural lighting are equipped with a system of electric lighting which is switched-on only while technological handling operations are carried out in the presence of the attending personnel: loading, unloading, reloading, etc. For the most part of the 24-hour period the lighting is switched-off, and the personnel is absent; thereby, favourable conditions are created for nocturnal rodents.

In view of the above-stated, the present invention ensures automatic setting in operation of the device for ridding of rodents during the period when people are not present in the warehouse, and automatic deenergising of said device while the warehouse is serviced. For this to be done, the input terminals of the pulse generator are coupled to contacts 42 and 43 of the switch actuating the lighting system in the premises where the protected pallets are arranged. With such connection the terminals of the generator prove to be connected in series with illumination lamps 44, while contact 45 of the switch is connected in parallel with said terminals. When the lighting is switched-off, the terminals of the generator become shunted, and the generator stops operating. Switching-off of the lightning causes supply of the mains voltage, less the voltage drop across the lamps (10 to 20 V, depending on the quantity and power of the lamps), to the input of the pulse generator. It should be noted that the circuit of the source of high-voltage pulses according to the invention continues operating steadily when the input voltage is at least 80 V.

Automatic putting of the device in operation when the lightning system in the warehouse is deenergised not only saves

electric power, but also reduces the probability of accidental action of the high-voltage pulses on the attending personnel.

An additional technical effect of increasing the service life of the illumination lamps also manifests itself here. With  
5 the lighting deenergised, the current supplying the source of pulses flows through filaments of the incandescence lamps and keeps the lamps in the warmed-up state. As is known, the resistance of the filaments of illumination lamps in the cold state (disconnected from the mains) is one order of magnitude  
10 smaller than in the hot state (when glowing). That is the reason why lamps burn out: leading-in wire supports become destroyed, most often on switching-on. It was established experimentally that current whose intensity amounts to tens of milliamperes is sufficient for warming-up the filament, which  
15 ensures a several-fold increase of the lamp service life. The actual value of the current consumed by the source of pulses is much smaller than that required for the filaments of incandescence lamps to glow, but it is much larger than the minimum value needed for warming them up.

20 The device of the invention operates in the following manner. After packaging means are arranged in the warehouse, toggle switches on the panels of the sources of high-voltage pulses, which control switching-on of the high-voltage transformers 11 (40), to the load of which at least one pallet  
25 is coupled, are brought to position "on". After the attending personnel has left the premises, the lighting in the premises is deenergised, and the entrance doors are locked (the sequence may be reversed). As a result, the deratizator is set to the working state (it is connected to the mains of 220 V, 50 or 60  
30 Hz).

As soon as rodents appear in the premises, the detector 9 operates, closing contact 33 of the power supply circuit of the relay 32. Its contacts 34 and 36 couple the pulse generator to the primary power supply source, and the unshunted resistor 31  
35 provides holding current for the relay 32.

Approaching the pallet with the load, the rodent (a rat, a mouse, a rabbit, and the like) snuffs thoroughly the route to follow. It was established experimentally that rodents almost always touch the linear electrodes on the pallet with their  
40 noses, where the most sensitive receptors are located. At a

distance of 3 to 15 mm from the electrodes, depending on the amplitude of voltage pulses, there occurs an arc discharge, accompanied by an arc glow and a characteristic crackling noise. A train of opposite-polarity current pulses flows from the electrode through minute punctures produced in the skin on the rodent's nose and then through the rodent's body, recharging the capacitance of said body and causing convulsive contraction of the muscles. In response to such a comprehensive action the animal jerks back its head; advancing further in the same direction, apparently, from force of inertia, the animal almost immediately touches the electrodes for the second and sometimes even for the third time, this causing similar effects and loud squeaks of the animal. The animal bounces back, and, the space (in the laboratory set-up) being limited, it takes refuge in the corner and sits there almost motionless for at least 15 minutes. Then the animal may make a second attempt. The result will be similar, and after that the animal refuses to approach the electrode, even if stimulated to do so. Rats feel at a distance of 5 to 10 cm from the electrode when high-voltage pulses are supplied thereto, and do not approach the object any more.

In an experimental checking of the device efficiency in a warehouse having an area of 100 sq. metres, three pallets equipped with electrodes according to the present invention were coupled to the set-up. Three control pallets without protection were arranged nearby in the same sequence. Baits (confectionery products) were distributed uniformly on all six pallets. Up to 30 pallets with similar products packaged in standard fibre-board boxes were left to stand 3 to 5 metres away from the above-stated pallets. In twenty-four hours the bait on the control pallets was eaten, whereas on the protected pallets it was left untouched. In two weeks of experimental operation of the device it was found that rats had left the warehouse. After the set-up was disconnected, the bait on the unprotected pallets remained untouched during a week.

Thus, the present invention is a radically novel device in the range of technical means for ridding of rodents, and its main advantages are as follows:

simplicity and reliability of design in combination with a low consumption of power: no more than 3.0 W per sq. metre of the area reliably protected from rodents;

repulsive and non-lethal action exerted on rodents, which  
5 is safe for the health of the attending personnel, additional measures for ensuring electrical safety (provision of a protection unit in the source of high-voltage pulses and switching-on of the primary power supply source with the help of the lighting switch) guaranteeing the safety level no lower  
10 than that of household electrical appliances;

the boundary of the zone of action of the repulsive effect almost coincides with the boundaries of the object being protected and precludes the feasibility of rodents' access to the load (products) arranged on said object;

15 the application of the device does not affect substantially the organisation of jobs in the warehouse, it does not reduce useful floor areas thereof, nor does it require re-equipment of the load-handling equipment and mechanisms.

#### 20 Industrial Applicability

The present invention can be used for deratization of food stores and warehouses, especially those where a unitized system of load transportation and storage is employed, particularly, with load packaging means.

25 Characteristically, the time and capital expenditures for carrying out the invention are minimum, the strength of pallets increases, while the technology of performing load-handling jobs and transportation remains unchanged.



## CLAIMS:

1. A device for ridding of rodents, comprising a body made of a dielectric material, provided with high-voltage contact electrodes secured thereon in the place where the rodent will inevitably touch said electrodes, said electrodes being connected by means of a power supply system with a primary power supply source, CHARACTERISED in that the body is made is a packaging means with a load platform 1, the power supply system is provided with a control unit 7 made as a three-electrode time-setting device, with a source of high-voltage pulses, made as a high-voltage transformer 10 and a pulse generator comprising a power capacitor 14, a controlled key 13, a diode 8, a charging resistor 19, and power supply terminals, contact electrodes 3 and 4 being coupled to free terminal 11 of the transformer secondary, the beginning of the transformer primary and the point of connection of the end of the transformer primary and of the beginning of the transformer secondary being coupled through a two-way contactor 27 to the output terminals 12 and 17 of the pulse generator, the input terminals being coupled to the primary power supply source, the diode 18 and the charging resistor 19 being inserted in the conducting direction into one bus of the pulse generator in series from the input terminal 15 to the output terminal 12 thereof, the controlled key 13 being inserted into another bus of the pulse generator, the power capacitor 14 being coupled with its outputs between the input terminal 16 and the beginning of the primary of the transformer 10, the anode and the cathode of the time-setting device 7 being coupled to the input terminals 15 and 16 of the pulse generator, the control output 26 of the time-setting device being connected to the controlled output 25 of the key 13.

2. A device according to Claim 1, CHARACTERISED in that the packaging means is made as a returnable or expendable pallet, the load platform 1 bears on the floor through non-metallic supports 2, and the contact electrodes 3 and 4 are made linear and are arranged in grooves provided in the load platform and along the periphery of the packaging means, said electrodes being galvanically interconnected.

3. A device according to Claim 1, CHARACTERISED in that it is provided with a quick-disconnect electric contact 5 made as

a resilient member, whose mating parts are coupled to the high-voltage output 11 of the transformer and to the contact electrodes 3 and 4, said mating parts being mounted on the stationary supports in the premises and on the deratizator body, respectively.

4. A device according to Claim 1, CHARACTERISED in that it is provided with a non-contact detector 9 and with a safety device 8 comprising a d-c source 28 made as a full-wave rectifier 29 and a filtering capacitor 30, the a-c diagonal of the rectifier 29 being coupled to the buses of the primary power supply source through a current-limiting resistor 31, the winding of the relay 32 and "dry" contact 33 of the non-contact detector 9 being inserted in series into the d-c diagonal of the rectifier 29, the make contact 34 of the relay 32 being inserted into the bus between the point of coupling the a-c diagonal of the source 28 and the output terminal 35 of the safety device 8, the break part of the change-over contact 36 being coupled in parallel to the current-limiting resistor 31, and the make part of the change-over contact 36 being coupled between the point of coupling the current-limiting resistor 31 to the primary power supply source and the second output terminal 37 of the safety device 8.

5. A device according to Claim 1, CHARACTERISED in that it is provided with a contactor which couples the input terminals 15 and 16 of the pulse generator to the primary power supply source through the contact of switch 45 of the lighting network in series with illumination lamps 44, the contact of the switch 45 being connected in parallel with said terminals.

6. A device according to Claim 1, CHARACTERISED in that it is provided with a second high-voltage transformer 40 similar to the first high-voltage transformer 10, their primary windings being coupled through a second two-way contactor 41 to the output terminals 12 and 17 of the pulse generator in parallel aiding, the free output of the second high-voltage transformer 40 being coupled to the high-voltage contact electrodes insulated from the electrodes coupled to the first transformer.

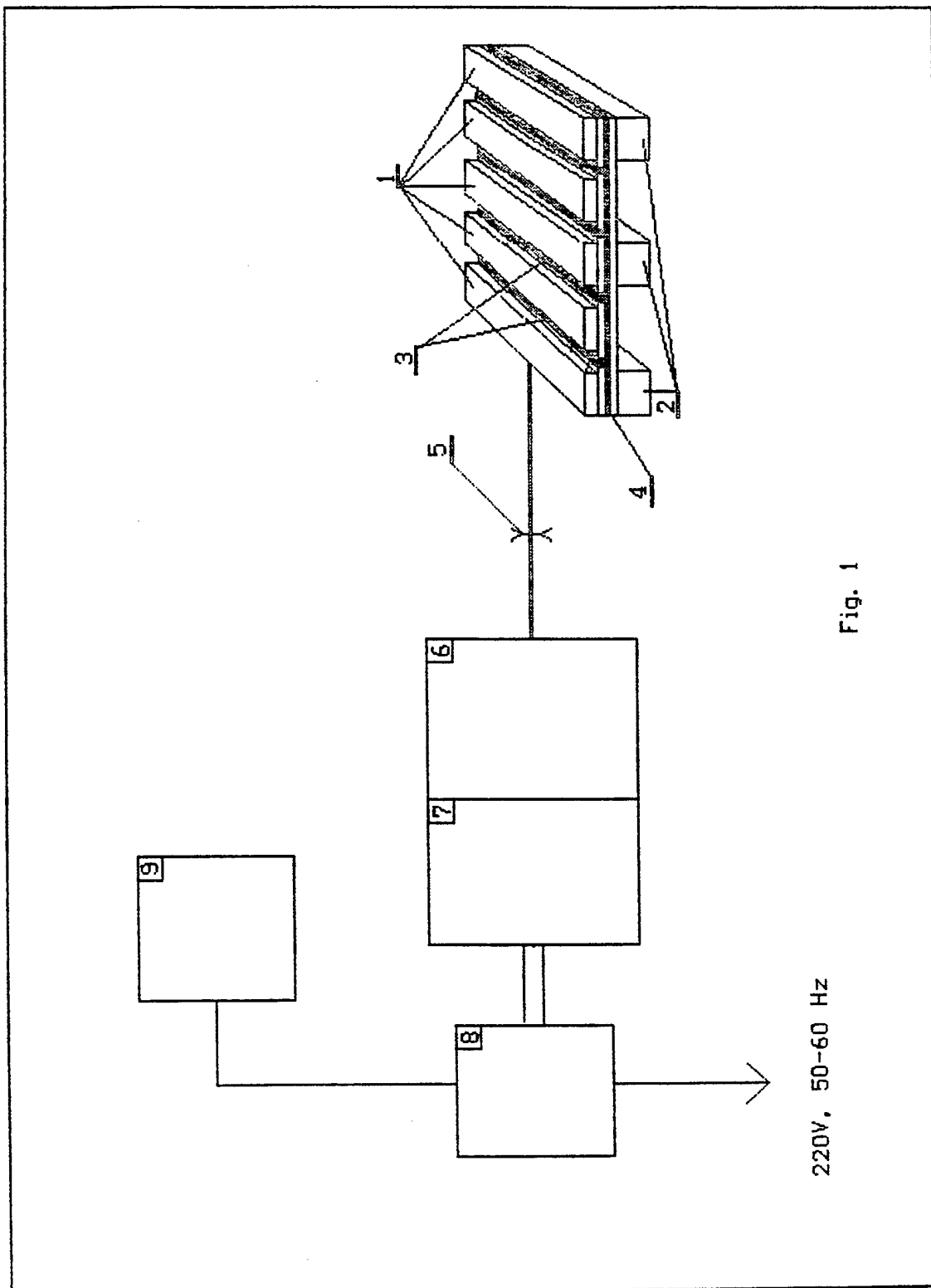


Fig. 1

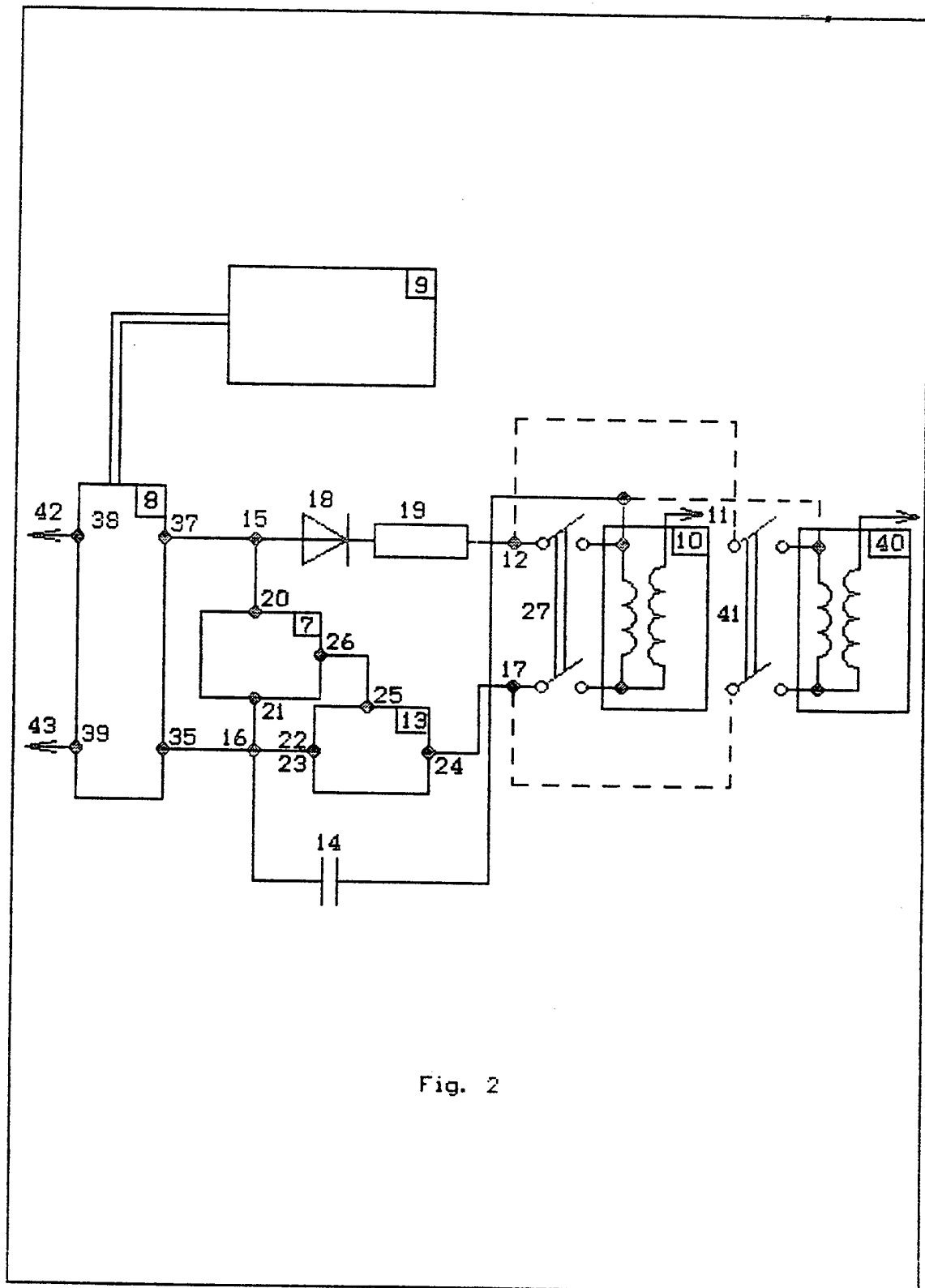


Fig. 2

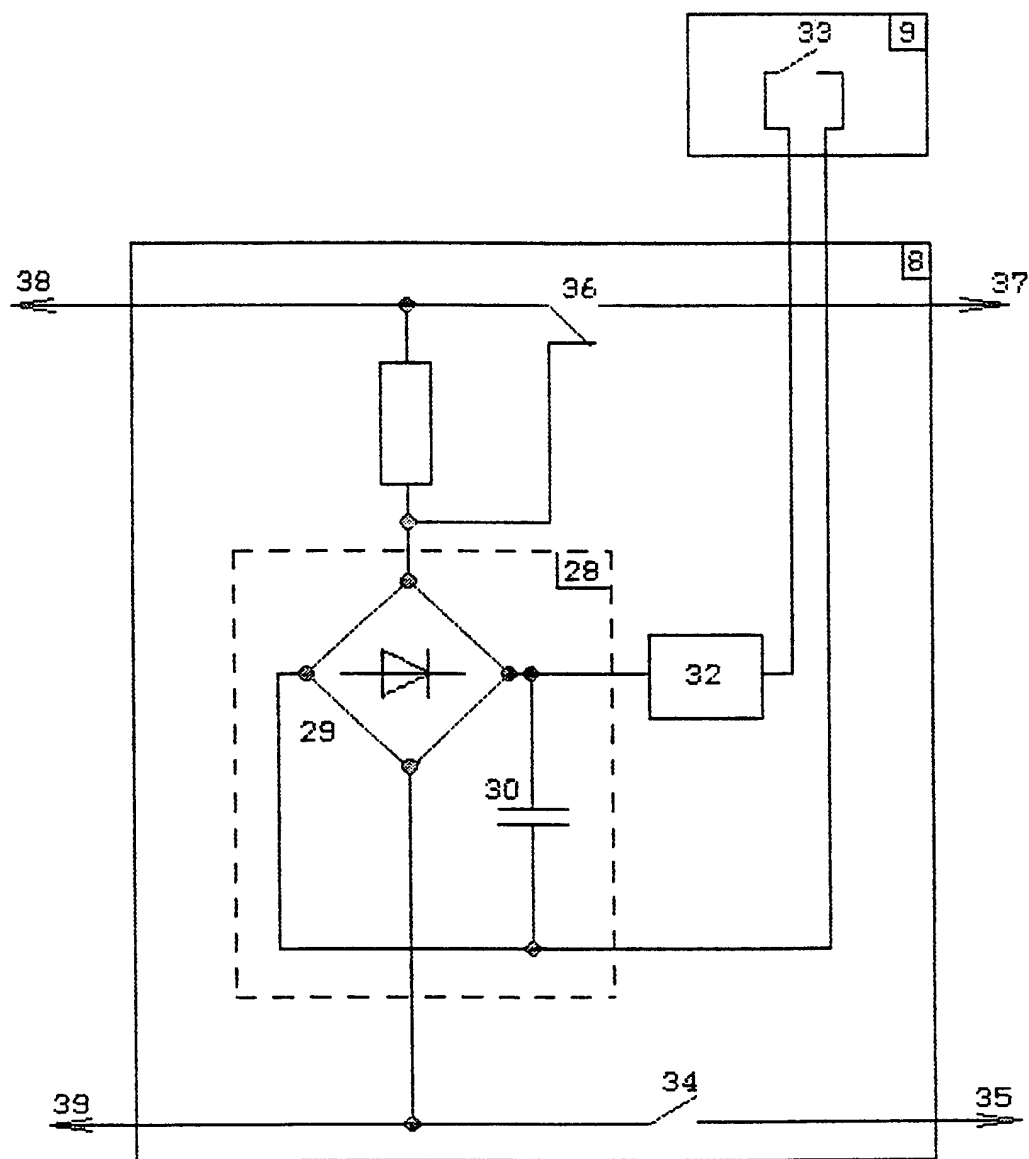


Fig. 3

-4/4-

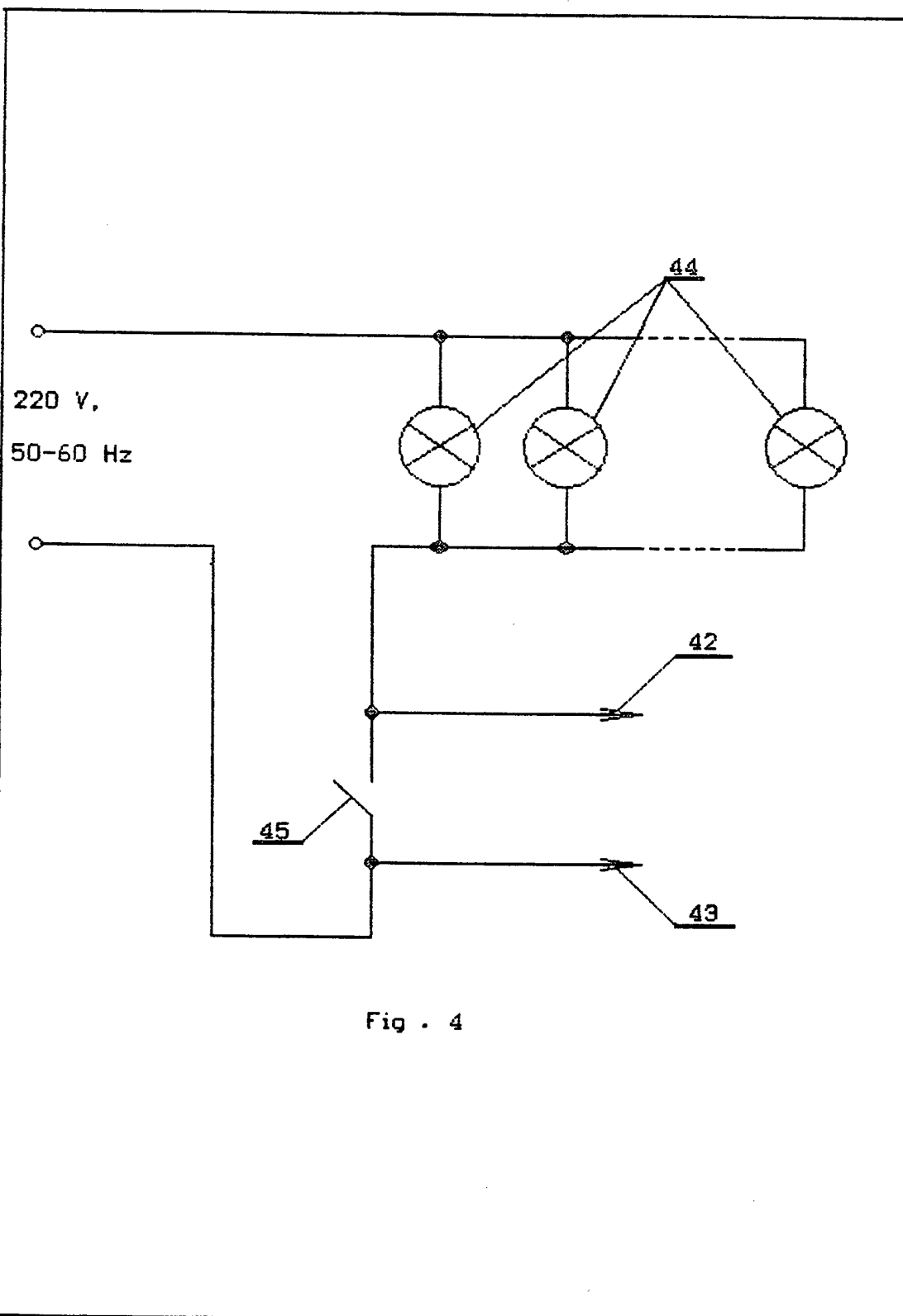


Fig . 4

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/RU 95/00265

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 H05C1/04 A01M23/38 B65D19/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 H05C B65D A01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,3 772 529 (BOEING P) 13 November 1973 see column 3, line 10 - line 65; figure 2 ---	1
A	DE,C,44 05 671 (HORIZONT GERAETEWERK) 4 May 1995 see column 4, line 21 - line 40; figure 4 ---	1
A	DE,A,28 32 149 (KARL SCHERMER & CO APPARATEBAU) 31 January 1980 see page 10, line 7 - line 31; figures 1,5 ---	1,3
A	GB,A,2 220 122 (CONTECH ELECTRONICS INC) 4 January 1990 see abstract; figures ---	1
A	FR,A,610 704 (PERRIN DE BRICHAMBAUT) 11 September 1926 see claim 1; figures ---	1
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

8 May 1996

Date of mailing of the international search report

1 5. 05. 96

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+ 31-70) 340-3016

Authorized officer

Marti Almeda, R

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/RU 95/00265

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US,A,5 365 858 (KUHNS JOSEPH H) 22 November 1994</p> <p>-----</p>	



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/RU 95/00265

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-3772529	13-11-73	NONE	
DE-C-4405671	04-05-95	EP-A- 0669790	30-08-95
DE-A-2832149	31-01-80	NONE	
GB-A-2220122	04-01-90	US-A- 4949216	14-08-90
FR-A-610704	11-09-26	NONE	
US-A-5365858	22-11-94	NONE	

**PUB-NO:** WO009701262A1  
**DOCUMENT-IDENTIFIER:** WO 9701262 A1  
**TITLE:** A DEVICE FOR RIDDING OF  
RODENTS: AN ELECTRICAL  
DERATIZATOR  
**PUBN-DATE:** January 9, 1997

**INVENTOR-INFORMATION:**

<b>NAME</b>	<b>COUNTRY</b>
ROSCHUPKIN, EVGENY YAKOVLEVICH	RU
BAGAEV, VLADIMIR IVANOVICH	RU
SOKOLENKO, KONSTANTIN KONSTANTI	RU
SCHERBAN, GRIGORY ANDREEVICH	RU
KRUPSKY, SERGEI ALEXANDROVICH	RU
TIKHONOV, VIKTOR PAVLOVICH	RU

**ASSIGNEE-INFORMATION:**

<b>NAME</b>	<b>COUNTRY</b>
ROSCHUPKIN EVGENY YAKOVLEVICH	RU
BAGAEV VLADIMIR IVANOVICH	RU
SOKOLENKO KONSTANTIN KONSTANTI	RU
SCHERBAN GRIGORY ANDREEVICH	RU
KRUPSKY SERGEI ALEXANDROVICH	RU
TIKHONOV VIKTOR PAVLOVICH	RU

**APPL-NO:** RU09500265  
**APPL-DATE:** December 7, 1995

**PRIORITY-DATA:** RU95110706A (June 23, 1995)

**INT-CL (IPC):** H05C001/04 , A01M023/38 ,  
B65D019/00

**EUR-CL (EPC):** A01M023/38 , B65D019/00 ,  
H05C001/04

**ABSTRACT:**

The device for eliminating rodents in the form of an electrical anti-rat device comprises a body made from a dielectric material and made as a packaging means with a load platform (1) and supports (2), provided with high-voltage electrodes (3 and 4) secured on the packaging means in the place where the rodent will inevitably touch them and connected to a power supply system, wherein a source of high-voltage pulses (6) is made as a high-voltage transformer (10) and a pulse generator (10), comprising a power capacitor (14), a controlled electronic key (13), a diode (18), a charging resistor (19), and power supply terminals. The electrodes (3 and 4) are coupled to the free terminal (11) of the transformer secondary, the beginning of the transformer secondary and the point of connection of the end of the transformer primary and the beginning of the transformer secondary are coupled through a two-way contactor (27) to the output terminals (12 and 17) of the pulse generator, the input terminals (15 and 16) thereof are coupled to the primary power supply source. The power supply system is provided with a control unit (7). The packaging means is made as a returnable or expendable pallet, the load platform (1) rests on the floor through non-metallic supports (2), and

the contact electrodes (3 and 4) are made linear, arranged in grooves provided in the load platform and along the periphery of the packaging means, and galvanically interconnected. The device has a quick-disconnect electrical contact (5) for coupling to the power supply system. The device is provided with a non-contact detector (9) adapted to detect rodents and with a safety system (8) for servicing personnel. The device is provided with a contactor for automatic setting thereof which is activated as soon as the lighting in the premises is switched off. For increasing the scope of protection, the device is provided with a second high-voltage transformer (40).